

Gem Trade LAB NOTES

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DIAMOND

The diamond shown in figure 1, which was examined in the New York Gem Trade Lab, has an unusual finish on the table. Although we have seen this effect before on a smaller facet, we are at a loss to explain it. The table does not have the whitish, burned appearance typical of a repolished burned stone on which the table has been overlooked; nor are there any polishing lines to suggest burning during polishing.



Figure 1. Irregular surface on the table of a diamond. Magnified 35 $\times$.

EMERALD

A True Treasure

An intriguing emerald ring seen recently in the Santa Monica Gem Trade Lab was set with a very fine natural emerald, measuring approximately 6.4 mm $\times$ 6 mm, that appeared to be of Colombian origin. Half of the golden shank and a portion of the bezel were encrusted with a calcareous deposit, probably a type of coral, as illustrated in figure 2. X-rays done by another laboratory revealed that the largest encrusted area around the shank contains a button-shaped object. The ring was recently recovered off the coast of Panama by a salvage diver—treasure hunter from Norwalk, California. The ship that carried the ring was believed to have gone down in a storm in 1687.



Figure 2. Emerald ring recovered from the ocean after approximately 300 years. The stone measures 6.4 mm $\times$ 6.0 mm.

Fake Specimen

Fake mineral specimens and fake gem minerals have been encountered in greater numbers lately. Some

of these specimens are very cleverly crafted and would easily fool an inexperienced buyer. The Santa Monica laboratory recently examined the fake "emerald" crystal pictured in figures 3 and 4, which measured 16

mm $\times$ 16 mm $\times$ 22 mm long and weighed 41.19 cts.

Someone went to a great deal of trouble to deceive the potential buyer. A rough crystal of near-colorless beryl was meticulously hollowed out, leaving a very thin shell. The hole was then plugged with an unidentified crystalline material; a green cement served as the adhesive and gave the piece the color of fine emerald. The end of the assemblage was then coated with a mixture of mica flakes and epoxy to give the illusion of a natural mica coating at the crystal's original point of attachment to the matrix. The mica can be seen in figure 3, at the top right of the crystal, and is shown magnified six times in figure 5. Figure 6, taken at 25 times magnification, shows the thin, near-colorless skin, the green coloring inside, and a rather large bubble in the cement. Actually, the bubbles in the cement were the only indication of poor workmanship in the creation of this "emerald" crystal illusion, and they were the main clue to the skullduggery involved.

Synthetic Green Beryl Reported from Australia

I. Threadgold, M.Sc., Ph.D., and G. A. Tombs, F.G.A.A.—both of Sydney, Australia—have sent us the following information regarding some unusual green beryl that they examined recently. Although a more detailed article is scheduled to ap-

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Figure 3. Fake emerald crystal, 41.19 cts.



Figure 4. Large bubble, plainly visible, in the emerald crystal illustrated in figure 3.

pear in the *Australian Gemmologist* within the next few months, they felt that people throughout the world should be made aware of this material as soon as possible.

Some cut beryl specimens, reportedly from Australia, along with two rough crystals that were sup-

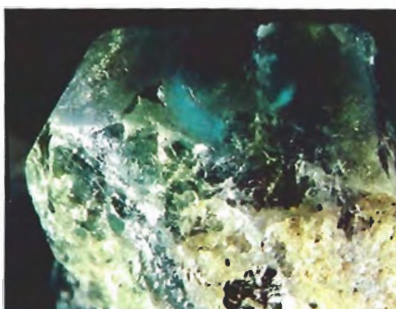


Figure 5. Mica flakes mixed into epoxy give a more natural appearance to the fake emerald crystal pictured in figures 3 and 4. Magnified 6 $\times$.

Figure 6. Large bubble and near-colorless skin of the fake emerald crystal illustrated above. Magnified 25 $\times$.



posedly from the same source, were submitted for examination to the Gemmological Association of Australia, in Sydney. The finely polished stones were highly transparent, with few inclusions, and ranged in color from medium dark green to a paler yellowish green.

The refractive index on the cut stones was a little low, at 1.567 to 1.572; the specific gravity was 2.67. The stones were inert to any ultraviolet radiation. One stone showed very weak chrome lines, as well as a faint line at approximately 4200-Å (probably due to vanadium) in the absorption spectrum.

An analysis of the chemistry of two of the cut specimens, the two crystals, and a natural Colombian emerald (for control) was conducted using an electron microprobe. Significant variations in chemistry existed between the rough crystals and the cut stones. The cut stones showed very little, if any, chromium, quite a bit of vanadium and chlorine, but no traces of iron, magnesium, or sodium. The rough crystals, on the other hand, had fair amounts of chromium, iron, magnesium, and sodium, with no vanadium or chlorine. On the basis of the test results, Dr. Threadgold and Mr. Tombs believe that the crystals are natural emerald but that the cut stones, which were purported to be from the same source, are actually synthetic beryl, colored by vanadium. The few inclusions present in the cut stones were of the flux type found in Kashan synthetic rubies.

Editor's Note: The cut stones described here would be considered synthetic emerald by American gemologists provided the color was dark enough. British and Australian gemologists, however, require chromium to be the coloring agent for the material to be described as natural or synthetic emerald.

Unusual Inclusions in Synthetic Emerald

A synthetic emerald submitted to the Los Angeles laboratory for iden-

tification contained a rather unusual appearing inclusion (see figure 7). The staff at the laboratory does not recall ever seeing an inclusion with a pattern quite like this one. The presence of typical flux veils in several areas and the low refractive indices of 1.561–1.564, low birefringence, and low specific gravity proved the stone to be synthetic.

A characteristic that is often observed in synthetic emeralds is a red transmission when exposed to strong light. This phenomenon results from the high chromium content of the stone, which gives a visible red fluorescence when excited by a strong light. As shown in figure 8, the stone discussed above was an extremely strong red transmitter. Some chromium-rich natural emeralds may transmit red, but rarely to the degree that this synthetic did.

The Los Angeles laboratory viewed another synthetic emerald that was

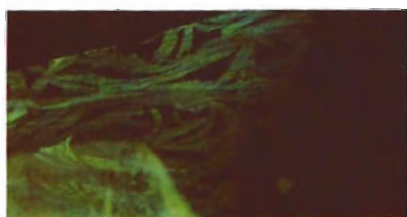


Figure 7. Unusual patterned inclusion in a synthetic emerald. Dark-field illumination, magnified 25×.

Figure 8. The stone pictured in figure 7 was also a strong red transmitter. Transmitted light, magnified 10×.

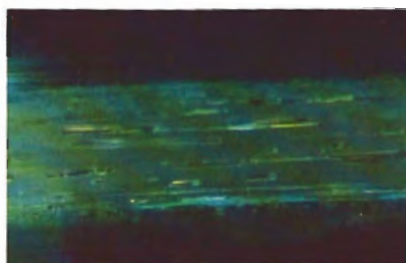
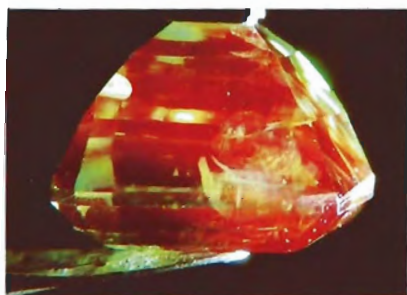


Figure 9. Yellow two-phase inclusions in the seed plate of a synthetic emerald. Dark-field illumination, magnified 70×.

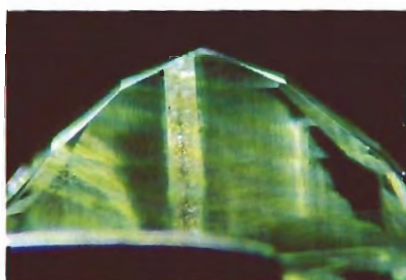


Figure 10. Seed plate in a synthetic emerald. Dark-field illumination, magnified 20×.

unusual in that it had yellow two-phase inclusions randomly oriented among near-colorless two-phase inclusions (see figure 9) throughout the near-colorless seed plate that passed entirely through the stone (see figure 10). This synthetic also contained uniform parallel growth bands and typical flux veils, one of which intersected the near-colorless zone. The refractive indices, birefringence, and specific gravity were all low, as expected.

OPAL

A combination pin and pendant set with a beautiful light pink carving of a woman's head was recently submitted to the Los Angeles laboratory for identification (see figure 11). The carving measured approximately 33.2 mm × 26.4 mm. At first glance the material looked somewhat like coral, but subsequent testing proved

it to be common opal. Microscopic examination revealed a structure with a slightly mottled appearance rather than the wavy parallel-fibrous structure seen in coral. The unique design of the piece was an attractive blend of metal and gemstone, with the metal around the carving following the pattern of the curls in the woman's hair.

PEARLS, CULTURED

Bob Crowningshield, our contributing editor from New York, reports on procedures currently used to cultivate Biwa pearls, which he observed during a recent trip to the Orient.

At Lake Biwa, in Japan, Mr. Crowningshield visited a completely artificial growing area that uses huge pond/tanks filled with artesian water rather than the lake itself. The mussels grow much faster in this environment than in the lake, and they deposit nacre almost all year. The mother mussels (*Hyriopsis schlegeli*) are about four years old and 10 cm long when the deft operators make from 15 to 20 careful incisions in each mantle and tuck a piece of

Figure 11. Carved opal (33.2 mm × 26.4 mm) mounted in a combination pin and pendant.



tissue into each cut. A variety of the genus *Odonata* (which itself is too fragile for use as a "mother") usually serves as the source of the mantle tissue inserts, since it has such colorful nacre. Only about 0.7 mm of the extreme outer edge of the mantle is used for the tissue inserts.

If all goes well, in about three years the animals will be carefully opened and the 30 to 40 cultured pearls squeezed out. At this point, the mother mussel is about 15 cm long, with additional mantle tissue that can be used to accommodate another row of incisions and inserts. The animals are returned for a second crop to grow in the old "sacs" and a first crop in the new incisions. If the mantle tissue of one of the colorful molluscs was used the first time, the second crop will also have that characteristic. Should the operator who makes the incision and inserts the tissue piece go through the mantle, the tissue may lodge on the shell and produce a blister or a row of blisters (figure 12).

Not only can the farmer-operators control the color somewhat, but they can also exercise some control over the shape of the cultured pearl. A long piece of tissue is used to produce "sticks" and "doublets," and two interlaced pieces will produce crosses. Mr. Crowningshield suspects that the fancy "dragons" are the result of serrated tissue inserts.

Second (and, in rare instances, third) crops are progressively less spherical and less abundant when harvested. Both salt-water and freshwater cultivators have made strides in propagating spat artificially.

In Perth, West Australia, Mr. Crowningshield was given a "Broome pearl" (see figure 13) that is actually a blister cultivated in the shell of *Pinctada maxima* near the northern city of Broome. The cultivators use plastic of various colors as nuclei; a bright red nucleus, for instance, produces an attractive red/pink blister. The X-radiograph in figure 14 shows the transparency to X-ray of the plastic nucleus in the "Broome pearl."



Figure 12. Fresh-water mussel shells, probably *Hyriopsis schlegeli*, used to culture pearls in Lake Biwa, Japan. In these cases the tissue inserts have lodged on the shell and produced blisters.



Figure 13. A cultured blister pearl from Broome, Australia.

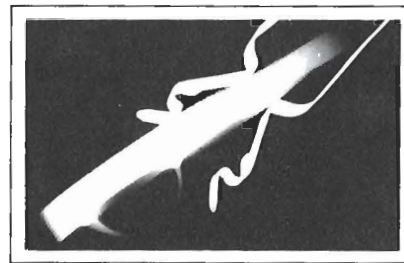


Figure 14. X-radiograph of a cross-section of shell and "Broome" cultured blister pearl.

Figure 15. Light yellow natural sapphire after heat treatment. It was reported to be subject to fading. Magnified 12 $\times$.



Figure 16. Dark yellow natural sapphire after heat treatment, reportedly not subject to fading. Magnified 10 $\times$.



SAPPHIRE

While in Sydney, Australia, Bob Crowningshield visited the sapphire-cutting factory of Arrowatta Holding Ltd. He was told there that virtually all the rough from certain mines is heated to lighten the color and diminish the green dichroic direction. Stones up to a carat in size are cut with automatic machinery and are quite beautifully done.

During Mr. Crowningshield's trip to the Orient, he received from the managing director of the Bangkok Gem Exchange a 2.5-ct. light yellow sapphire of a type produced seven or eight years ago by heating colorless sapphire (see figure 15). Since this type was likely to fade, it was not sold. The stone illustrated in figure 16 is a darker yellow sapphire of the type that is said to be produced by heating certain cloudy stones. The color is reported to be permanent, but it has not yet been tested in the GIA laboratory.

SUGILITE

In the Summer 1981 issue of *Gems & Gemology*, we mentioned a small, thin piece of manganoan sugilite that came into the laboratory for identification. Since that time, all three divisions of the Gem Trade Laboratory have had many cut examples of sugilite submitted for identification. The stones examined to date, both cabochon and faceted, have ranged in weight from approximately one to seven carats.

This particular color of sugilite, which originates from the Hotazel area of South Africa, is relatively new to the gem market. It is being marketed under the trade names Royal Azel and Royal Lavulite.

Figure 17 shows some jewelry fashioned from sugilite together with some of the rough material. The three stones in figure 18 represent some of the cabochons seen in the Santa Monica lab to date, while figure 19 shows a sugilite carving that measures 7.6 cm wide by 3.2 cm thick and 13.6 cm high.



Figure 17. Jewelry fashioned from sugilite together with a piece of the rough material.

Figure 18. Sugilite cabochons, average weight 5 cts.





Figure 19. Sugilite carving, 7.6 cm wide $\times$ 3.2 cm thick $\times$ 13.6 cm high.

For more information on manganoan sugilite and its properties, see this section of the Summer 1981 issue of *Gems & Gemology*, pages 105 and 106.

WORLD'S LARGEST TAAFFEITE?

The Santa Monica laboratory recently issued an identification re-

port on what is perhaps the world's largest taaffeite. The grayish-purple stone, pictured in figure 20, weighs 10.13 cts. Numerous small inclusions were observed under the microscope. One of the inclusions, shown in figure 21, appeared to be a negative crystal with a series of fingerprint-like, partially healed fractures radiating from it. Only a few



Figure 20. World's largest taaffeite? The stone weighs 10.13 cts.



Figure 21. Inclusions in taaffeite. Dark-field illumination, magnified 45 $\times$.

taaffeites are known to exist, and to the best of our knowledge this is the largest one that has been recorded to date.

ACKNOWLEDGMENTS

Bob Crowningshield in New York took the photographs in figures 1 and 14; and Andrew Quinlan, from the same laboratory, was responsible for figures 12, 13, 15, and 16. In Santa Monica, Karin Hurwit photographed the item in figure 2 and John Kolvola furnished figures 5, 6, 20, and 21. Robert Kane, of the Los Angeles lab, supplied the photos in figures 7, 8, and 9. His colleague in Los Angeles, Shane McClure, provided figures 10 and 11. The items in figures 3, 17, 18, and 19 were photographed by Tino Hammid, of GIA Gem Media. Tony Kampf, of the Los Angeles County Natural History Museum, supplied figure 4.